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## THE MYTHS OF CRANIAL CAPACITY AND INTELLIGENCE

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### ABSTRACT

The evolution of the intelligence of man is based on the myth that there is a relationship between cranial capacity and intelligence. In the nineteenth century, scientists used inaccurate data to prove that racial, sexual and class inferiority was due to "low" cranial capacity. However, no matter if one refers to cranial capacity per se, brain weight, or brain-body ratio, the evidence shows that all fossil hominids possess either an ape or human cranial capacity with no data to support human evolution from an ape-size brain ancestry.

### INTRODUCTION

In the book Human Evolution, Stanley Garn (1967, p. 10) begins his essay with this typical statement: "In the last million years, our own genus Homo has made considerable and apparently rapid evolutionary progress. From a rather small ground-scrampering animal, man has emerged as a distance runner...starting with a small brain of no more than pongid proportions there has been a three-fold increase in human brain-volume...truly, evolution has reshaped us at both ends of the vertebral column, increasing our capacities to plan and pursue..."

Throughout the history of physical anthropology cranial capacity statistics of fossil and modern men alike have been used to illustrate both the process and different products of human evolution. Stephen Molnar (1975, p. 56) affirms Garn's statement in a later text claiming: "that the brain space and hence the brain has increased in size during the last two million years of evolution is extremely important in studies of human paleontology, and comparison on cranial capacity of the different fossils can be useful." Does the study of cranial capacities really support evolution or has it been a manipulation of numbers of mythical value?

### MEASURING CRANIAL CAPACITY

Cranial capacity has been measured in a variety of ways. Mustard, millet or flax seeds were used because they approached the closest to the mass of a liquid, but also, small lead shots were commonly used (Montagu, 1960). If mustard seeds were used, they were placed into the hollow skull through the foramen magnum by means of a funnel and agitated by the hand or an agitating instrument. When the skull was sufficiently packed, the material was poured into a measuring glass which was again agitated and packed. Different measurements on the same specimen could be made depending upon the way seeds were compressed, the speed with which the seeds were shot in, and the diameter of the neck of the funnel. Another method for measuring cranial capacity which is now used is to make an endocranial cast of the specimen, then measure the amount of water the cast displaces.

Indirect measurements can be made with different formula depending upon sex. Olivier (1969) lists these formulas: Male:  $359.34 + 365 \times 10^{-6}$  (length x breadth x auricular height). Female:  $296.4 + 375 \times 10^{-6}$  (length x breadth x auricular height). Changes are made in the formulas depending upon race and the thickness of the parietal bone.

Because of the possibility of arriving at accurate numbers of cranial capacity the past is replete with statistics used to support mythical conceptions.

## Cranial Mis-Measurements

The importance of measuring cranial capacity took place in the nineteenth century in the science of craniometry or skull measuring. Paul Broca who was on the faculty of clinical surgery in Paris collected a lot of data, thereby gaining respect and support for his research. He so boldly declared:

"In general, the brain is larger in mature adults than in the elderly, in men than in women, in eminent men than in men of mediocre talent, (and ) in superior races... other things equal, there is a remarkable relationship between the development of intelligence and the volume of the brain. (Stephen Gould, 1978, p. 44)."

Of particular interest, was that Broca actually felt that he had scientific evidence that women had smaller brains and, therefore, could not be equal to men in intelligence. After measuring two hundred and ninety two brains from Paris hospitals, he declared that men had 14% more cranial capacity (Molnar, 1975, says that women have on the average 10% less cranial capacity.)

One of Broca's colleagues at his school, Gustav Le Bon, wrote in France's most respected journal of anthropology:

"In the most intelligent races as among the Parisians, there are large numbers of women whose brains are closer in size to those of gorillas than to the most developed male brains. Gould, 1978, p. 48)"

He went on to describe how women act accordingly. Later on, in the nineteenth century, another craniometrician, Samuel George Morton, measured the cranial capacities of various races. He felt that the Swiss skulls had the hallmark of all races having the highest cranial capacities followed by other whites with Indians in the middle and Blacks on the bottom. His data is discredited by Gould (1978) because he: 1) changed methods of measurements from using white mustard seeds to lead shots with Caucasian skulls giving White's a "leading edge," 2) he withheld some specimens which he felt "atypical" of that race, and 3) he failed to recognize sexual differences in skulls.

Morton and Broca provided unscientific data to support the racism and sexism of the nineteenth and early twentieth century, but because they were sincere and convincing they were accepted by many scientists. Although very few scientists today would accept their thesis that the size of the brain of modern man is related to intelligence, some scientists have considered brain weight.

## The Myth of Brain Weight

Tobias (1970) wrote that the problem with measuring the cranial capacity is that it does not measure the actual mental capacity (i.e., the "thinking part" of the brain). A cranial capacity of 1,000 c.c., for example, includes brain tissue plus non-brain material such as roots, trunks of twenty-four cranial nerves, the thick dura mater, the arachnoid and pia mater, and finally, "receptacles" containing fluid and many blood vessels and sinuses. Thus, Tobias claimed that brain weight is more important than cranial capacity.

However, although brain weight may seem to be ideal, Tobias went on to say that there are too many factors which can alter brain weight at the time of death. A list of them are: sex, body, age, nutritional state during development, source of sample, cause of death, time measured after death, temperature at death, the level where the brain was severed for measurement, the presence or absence of cerebrospinal fluid, the presence or absence of meninges, and the presence or absence of blood vessels. Since many of these factors are not recorded during measurements Tobias (1970) admits that comparative studies of races, sex, etc., have been meaningless.

## Myth of The Correlation of Cranial Capacity and Intelligence

Basic to the support of the evolution of man's cranial capacity is the current knowledge of cranial variability. Although most textbooks claim that man's cranial capacity is around 1300 c.c., that is, only a theoretical average. Various healthy populations contain people who have cranial capacities well into the "fossil man" range. O. Schläginhaufen in 1950 found a skull of a Melanesian woman with a cranial capacity of 790 c.c. which is said to be the lowest on record (Schultz, 1966). Marvin Harris (1971) claimed that the variability of man's cranial capacity starts at 850 c.c.s. Bonin (1963) said that Raymond Dart mentioned in his discussion on his fossil man that he found Bantus with capacities of 511, 519, and

561 c.c.s. who were functional as herd boys and farmhands and although their cranial capacities would equal that of an adult gorilla, it was obvious that they were not pongid in their behavior. On the other hand, Schultz (1966) claimed that a very large gorilla had been found to have 685 c.c.s cranial capacity. So, as Holloway (1966, p. 58) explains it:

"One c.c. of chimpanzee cortex is not equivalent of one c.c. of human cortex, nor is it likely that any equivalent measure can be found."

Contrary to Broca's statement that eminent men had larger brains than men of mediocre talent, there is no correlation of c.c. of brain and mental capability in normal people. Eminent men such as Anatole France, Franz Joseph Gall, and Leon Gambetta are known to have had 1000 - 1100 c.c. of brain. They were just as intelligent as Oliver Cromwell, George Fordon and Lord Byron who had cranial capacities of 2200 c.c. and above.

#### Myth of The Evolution of Cranial Capacity

The fossil history is claimed to support the evolutionary theory that man's ancestors stemmed from a small chimpanzee brain australopithecine, to a "normal" sized brain Cromagnon as seen in the table.

Chimpanzee	393 c.c.
Gorilla	506 c.c.
Australopithecus	494 c.c.
<u>Homo habilis</u>	656 c.c.
<u>Homo erectus</u>	935 c.c.
Cromagnon ( <u>Homo sapiens s.</u> )	1370 c.c.

#### Average cranial capacities of Fossil Hominids.

Although the table shows a convincing argument for the evolution of man's cranial capacity, there is a lot of contradictory data.

First of all, Homo erectus crania of which Java Man and Peking Man are examples, were dated about 500,000 years B.P. and were said to average approximately 950 c.c. But, one of the oldest Homo erectus skulls, OH 9 dated at first to be 900,000 B. P. (Laskers, 1973) is now dated 1.2 million years (Nelson, 1985). Nicknamed Chellean Man, he is noted for his huge brow ridge, a "primitive" characteristic, yet he has the largest cranial capacity (1,067 c.c.) of all early H. erectus specimens (Nelson, 1985). Another skull, Solo Man, which is said to resemble OH 9 is dated 300,000 - 60,000 B.P. has 1,035 c.c. cranial capacity. So the older the dating of the fossil man doesn't mean the smaller the cranial capacity.

Contrary to belief, Homo erectus lived contemporaneously with many australopithecines. In South Africa a small mandible is found in the site of an earlier australopithecines. Nelson (1985) wrote concerning KNM-ER 3733, a Homo erectus skull claimed to have lived around the time of Chellean Man:

"A puzzling aspect of the KNM-ER 3733 is that it was found in the same geological bed with robust australopithecines (A. boisei) and perhaps A. africanus as well (Nelson, 1985, p. 497)." Thus it appears that man's supposedly immediate ancestor lived with his pongid brain progenitors.

Not all Homo erectus skulls contained small brains. One such example is Vertesszöllos Man dated 350,000 - 400,000 B.P. is estimated to have a cranial capacity of approximately 1400 c.c. which is above the average human cranial capacity (Day, 1977). Therefore, some of our supposedly immediate ancestors could have an above average cranial capacity.

Neanderthal Man, which is dated older than Cromagnon Man, had an average cranial capacity of 1470 c.c. Whereas, Cromagnon Man had 1370 c.c. (Lavelle, Shellis, and Poole, 1977). Poirier (1974, p.94) says:

"There has been an actual reduction of approximately 300 c.c. of brain since the time of the Neanderthals." Neanderthals supposedly evolved 250,000 B.P. so it would appear that man has evolved the "wrong" way since that time."

It has been argued by evolutionists that Homo erectus must have been Cromagnon's immediate ancestry because no modern type has been found with the earliest Homo erectus findings, however, skulls which have been found in plio/pleistocene strata with modern features and "normal" cranial capacity have not been accepted because they were "out of place." Lists of these findings are in Shute (1961) and Bowden (1977).

So indeed, there is no progression of cranial capacity from pongid to so-called modern man size even though some findings of fragmentary nature have been reconstructed to support the prevailing evolutionary theory.

#### Myth of The Unchanging Cranial Capacity

Estimates of the cranial capacities of various hominids have not always remained the same. Some estimates have changed because of different methods used but, some seem to be influenced by their place in their phylogenic interpretation.

One example is Oreopithecus which had long arms like an ape, some monkey characteristics but above all, hominid traits such as small canines, large iliac blades and a forward placed foramen magnum which indicated that the organism might have walked upright (Rosen, 1974). In 1970, when the crushed Oreopithecus skull was measured with direct and some indirect methods, its cranial capacity measured 490-640 c.c. (Strauss, and Schon, 1960). This was close to the range of australopithecines and swayed scientists to believe Oreopithecus filled the gap of hominid evolution in the Miocene era.

In 1963, the Yellow Version of the Biological Science Curriculum Studies taught in this section on human evolution:

"Subsequent careful studies, which require a great deal of time confirmed that Oreopithecus has so many human-like, rather than ape-like features that most authorities are inclined to place it as the earliest representative of the family of man-the Hominidae (John Moore, 1963, p. 661)."

This view is not accepted today, and Oreopithecus is mentioned very briefly in most textbooks as a swamp ape possibly related to the Apidium, a squirrel-like anthropoid. Szalay and Berg (1974) most recent estimation of Oreopithecus's endocranial volume was about 200 c.c. which is more in keeping with its monkey-like characteristics. Scientists literally made a monkey out of a "man."

Pittdown Man which was first viewed as a "missing link" between apes and man had cranial fragments which could be rearranged in various ways to alter his estimated cranial capacity. In December, 1912, Woodward Smith reconstructed its skull and declared Eoanthropus, as he was then called, as having an estimated cranial capacity of 1070 c.c. This estimate was within the Homo erectus range. However, when its jaw was made to fit its reconstructed cranium, its cranium had to be "expanded" since the jaw of a chimpanzee, which it was later proven to be, is much larger than a man's. So in 1922 after final reconstruction, the cranial capacity of Pittdown Man rose to 1200 c.c. At that time evolutionists concluded that man's brain evolved in Britain faster than his other ancestral characteristics. Later when Pittdown Man was discovered to be a hoax, australopithecines changed evolutionist's position back to the small-brain-to-big-brain sequence of evolutionary progression.

An example of a more recent change of cranial capacities was done by Ralph Holloway (1974) who took endocranial casts and by the water replacement method made more accurate cranial capacity estimates of fossil hominids. He found that the South African australopithecines were estimated to be substantially smaller than had been measured by other methods. Those previously estimated to exceed 500 c.c. were estimated by Holloway to be below 450 c.c. (Duffet, 1983, showed that many estimations of these hominids have been lowered over the years.). Also, Homo erectus craniums were estimated to have higher cranial capacities than earlier estimated. Thus, Holloway increased the cranial gap between man and australopithecines.

We have seen then that cranial capacities of reconstructed craniums can differ according to their perceived place in evolution. Furthermore, we have seen that modern populations have as many brain sizes within the range of supposedly man's ancestors. Scientists address this problem by calculating brain-body ratio.

#### The Myth of Brain-Body Ratio

Heavy emphasis so far has been placed on cranial capacity per se and not brain-body weight ratio. However, if one compares the human statistics with other primate statistics, the supposedly closest relatives of man do not necessarily have the closest brain-body weight ratio (Molar, 1975). Man has a 1:47 ratio but his supposedly closest relative the chimpanzee has a ratio of 1:13. The gorilla has a brain-body ratio of 1:42 but the night monkey with 1:85 and the Capuchin monkey with 1:83 show the highest primate brain-body ratio.

Some non-primates have high brain-body ratios closer to man than other primates. The top of the list is the bottle-nose dolphin with a 1:67 brain-body ratio (Lilly, 1961) and near the top is the house mouse with a brain-body ratio of 1:40 (Tobias, 1976).

The low cranial capacity of women which Broca used to show women's inferiority to man can be seen in a different perspective when brain-body ratio is considered. Relative brain size (cranial capacity/body weight X 100) for an eighteen year old male is 2.37 and for an eighteen year old female is 2.482 (Duffett, 1983).

An experiment was done to increase cranial capacity of rats to see if it would effect intelligence. Zamenhof (McLeod, 1983) injected somatotrophin into pregnant rats to increase brain cell growth and thereby produced 70.4% superbrain fetuses. On psychological testing there was no difference in performance and some cases worse. So, artificially increasing brain-body ratio as shown in that study doesn't increase intelligence.

Thus, it is found that brain-body ratio seems to be as equally meaningless as cranial capacity alone. But still, many attempts have been made to apply brain-body ratio to fossils.

Relatively few post-cranial bones have been found with fossil men. Those found have indicated that fossil hominids such as the australopithecines are of very small stature. Therefore, although they have small cranial capacities evolutionists conjecture that their brain-body ratio would "elevate" them to a cranial capacity worthy of the title "ape-men."

Gould (1974) did a brain-body ratio analysis of various hominids. He noted that mammals have cranial increase of about 2/3 the rate of the body because the body surface area of mammals also increases by about 2/3. However, a man's cranial increase to body size is much higher and definitive of Homo. According to brain-body ratio, then, australopithecines and early Homo habilis (recognized by many as the same as the former) conform to the mammalian brain-body ratio, whereas, KNM-ER 1470, early Homo and Homo erectus all have a human brain-body ratio.

#### SUMMARY

Cranial capacity as a measure of man's intelligence has never been proven -- it has only been a myth. Nineteenth century scientists used statistical measurements of cranial capacities to support racial, sexual, and class inferiority according to differences in cranial capacity. Even though today scientists have found that numbers ascribed to any population are speculations which can change due to new measured parameters, new fossil findings or new discoveries, this myth still remains with evolutionists: "super brain" intelligent man evolved from an ape size brain ancestor. Bonin (1963, p. 76), an evolutionist, shows his confusion by remarking:

"...that the brain increases in size as we go from australopithecine to modern man or to the upper Paleolithic for that matter is quite obvious and of course very gratifying. But the meaning of the increase is again not quite clear because as we all know brain size as such is a very poor indicator of mental ability..."

Even if someday evolution would be proven wrong by most scientists this myth may still be with us -- just the interpretation and presentation will be different.

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